REMARKS

The present application was filed on December 23, 1999 with claims 1 through 59. Claims 11, 12, 16, 17, 21, 22, 28, 36, 37, 39-46, 49, 52, 55 and 58 have been previously cancelled. Claims 1-10, 13-15, 18-20, 23-27, 29-35, 38, 47-48, 50-51, 53-54, 56-57, and 59 are presently

5   pending in the above-identified patent application. Claims 48, 51 and 57 are proposed to be cancelled herein and Claims 1, 24, 47, 56 and 57 are proposed to be amended herein.

In the final Office Action, the Examiner rejected claims 1-10, 24-27, and 29-35 under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps, and rejected claims 47, 48, 56, and 57 under 35 U.S.C. §112,

10   second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. The Examiner also rejected claims 48, 51, and 57 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner rejected claims 1, 3, 5-10, 47, and 48 under 35 U.S.C. §

15   102(e) as being anticipated by Zhong et al. (United States Patent Number 5,970,104). The Examiner also indicated that claims 13-15, 18-20, 23, 38, 50, 53, 54, and 59 are allowed, indicated that claims 24-27, 29-35, 56, and 57 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. §112, second paragraph, set forth in the Office Action, and indicated that claims 2, 4, and 51 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. §112, second

20   paragraph, set forth in the Office Action and to include all of the limitations of the base claim and any intervening claims.

Section 112 Rejections

Claims 1-10, 24-27, and 29-35 were rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap

25   between the steps. Claims 47, 48, 56, and 57 were rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. Regarding claims 1 and 24, the Examiner asserts that "step(s) showing functional/operational interrelationships of step 'selecting a path having a best path metric for a given state' with other steps" recited in the claim are

30   omitted.

Regarding claims 47, 56, and 57, the Examiner asserts that the functional/structural/connectional interrelationships of element "add-compare-select unit" with other elements, e.g., "branch metric unit," "pipeline register," "multiplexer," etc., "recited in the claim, for making the claimed signal processor being a complete connective, operative system" are omitted.

5   Claims 1, 24, 47 and 56 recite the elements or limitations that Applicants submit are essential to their respective patentabilty. Claims 1, 24, 47 and 56 each recite one or more elements that distinguish them from the prior art. It is clear that a claim is not required to contain all possible elements of an embodiment or contain all elements required to be operational. Notwithstanding the foregoing, although Applicants maintain that claims 1, 24, 47 and 56 recite all essential elements,

10   claims 1, 24, 47 and 56 have been amended to emphasize the relationship of the various elements, as requested by the Examiner. Thus, Applicants respectfully request that the rejection of claims 1-10 and 24-27, 29-35, 47, 56, and 57 under 35 U.S.C. §112, second paragraph be withdrawn.

Support for these amendments may be found, for example, in the Specification at page 11, lines 4-20. An add-compare-select unit (ACSU) computes path metrics using selected

15   precomputed branch metrics. It is well known that the ACSU computes path metrics and selects the best one for each state. Each multiplexer selects the appropriate branch metrics, which are then sent to the ACSU. See, Specification at page 11, lines 4-20.

Claims 48, 51, and 57 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

20   applicant regards as the invention. Claims 48, 51, and 57 have been cancelled without prejudice.

Independent Claims 1 and 47

Independent claims 1 and 47 were rejected under 35 U.S.C. § 102(e) as being anticipated by Zhong et al. Regarding claims 1 and 47, the Examiner asserts that Zhong discloses step/means (120) (see figure 1) for precomputing branch metrics using received signal (108) for

25   sequences of symbols (106) (see col. 2, lines 26-33 and 63-66); step/means (120) for storing said precomputing branch metrics in a memory (120 or 334) (see figures 1 and 3A) wherein 4 rows or 4 columns of the memory form 4 pipeline submemories (considered equivalent with the limitation "at least one pipeline register"); step/means (120, 112) (see figure 1) for selecting one of said precomputed branch metrics from one of said pipeline memories based on a symbol (121) or (b2, b1)

30   (see figure 3B) from or corresponding to a state selected from a set of (00, 01, 10, 11).

Independent claims 1 and 47 emphasize that the precomputed branch metrics are

based on the received signal and are stored in at least one pipeline register; and that a precomputed branch metric is selected from the at least one pipeline register based on at least one survivor symbol from at least one corresponding state. This combination of elements is not shown by any of the cited references.

5   Among other benefits, the precomputation of the branch metrics in a look-ahead fashion allows pipelining, as required by each independent claim, and thus a shortening of the critical path. This is not shown by the prior art.

       Zhong does not disclose precomputing branch metrics using a received signal for speculative sequences of one ore more channel symbols. Col. 2, lines 26-33 and 63-66 do not

10 disclose precomputing branch metrics using received signals for speculative sequences of one or more channel symbols. Rather, Zhong discloses that the Viterbi decoder calculates, at pre-selected times, branch metrics, branch indices and state metrics for the data, and determines the path of the data that has the greater likelihood of occurrence (Col. 2, lines 26-33 and 63-66). Zhong does not suggest precomputing branch metrics for speculative sequences of one ore more channel symbols,

15 but instead discloses to calculate branch metrics, branch indices, and state metrics at pre-selected times.

       As clear from the present specification, however, as well as the common usage of those of ordinary skill in the art, the term, "precomputing" means computing a particular value, such as a branch metric, during a current clock cycle that is required for a future clock cycle. As such

20 precomputing does not mean computing one type of value, i.e., a branch metric, before another type of value, i.e., a new path metric, as suggested by the Examiner. Further, the "precomputation" of a value necessarily requires storing the value for use at a later clock cycle in a pipeline register. The term "pipeline register" implies that a value is stored for use in a future clock cycle.

       The Examiner is invited to contrast the discussion in conjunction with FIG. 3 of the

25 present specification of a typical reduced state sequence, with the discussion in conjunction with FIGS. 4-6 of an RSSE algorithm with look-ahead, i.e., precomputating in accordance with one embodiment of the present invention. The branch metric and ACS computations in FIG. 3 must be performed in one clock cycle, as the RSSE of FIG. 3 does not contain any pipeline registers. Pipeline registers in the present invention allow the branch metrics to be computed ahead of time,

30 i.e., precomputed, and stored in the pipeline registers to be used by the ACS during the subsequent clock cycles.

Thus, Zhong does not disclose or suggest "precomputing" a value, i.e., computing the value, such as a branch metric, during a current clock cycle that is required for a future clock cycle. Further, Zhong does not disclose or suggest storing precomputed branch metrics in at least one pipeline register for a future clock cycle. The term "pipeline register" implies that a value is stored

5   for use in a future clock cycle.

Zhong discloses selecting a branch metric based on a state signal (col. 3, lines 4-14, col. 5, lines 17-47). Zhong does not disclose selecting one of said precomputed branch metrics from one of said at least one pipeline registers based on at least one survivor symbol from a corresponding state. As it is known in the art and clear from the specification, a survivor symbol is an estimate of

10   the transmitted symbol that is stored in the survivor memory unit (or "path memory" in Zhong's terminology). In Zhong's embodiment, the state signal 121 is a 2-bit signal, as there are 4 states in the trellis (see Fig. 2). It is well known by people of ordinary skill that the number of bits required to represent a survivor symbol does not depend on the number of states in the trellis. This proves that the state signal 121 in Zhong is different from a survivor symbol. It is also apparent from Fig. 1 in

15   Zhong that the state signal 121 is different from a survivor symbol stored in the path memory 123, as the state signal is generated in the add/compare/select 114 and not the path memory 123. Therefore, Zhong does not disclose selecting a precomputed branch metric based on a survivor symbol, as required by claim 1.

Thus, Zhong et al. do not disclose or suggest precomputing branch metrics using the

20   received signal for speculative sequences of one or more channel symbols; storing said precomputed branch metrics in at least one pipeline register; and selecting one of said precomputed branch metrics from the at least one pipeline register based on at least one survivor symbol from a corresponding state, as required by independent claims 1 and 47.

Dependent Claims 2-10, 14-15, 19-20, 23, 25-27, 29-35, 48, 51, 54, and 57

25   Dependent claims 3, 5-10, and 48 were rejected under 35 U.S.C. § 102(e) as being anticipated by Zhong et al.

Claims 2-10, claims 14-15, claims 19-20 and 23, claims 25-27 and 29-35, claim 48, claim 51, claim 54, and claim 57 are dependent on claims 1, 13, 18, 24, 47, 50, 53, and 56, respectively, and are therefore patentably distinguished over Zhong et al. because of their

30   dependency from independent claims 1, 13, 18, 24, 47, 50, 53, and 56 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

The Examiner has already indicated that claims 14-15, 19-20, 23, and 54 are allowed, indicated that claims 25-27, 29-35, and 57 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. §112, second paragraph, set forth in the Office Action, and indicated that claims 2, 4, and 51 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C.

5   §112, second paragraph, set forth in the Office Action and to include all of the limitations of the base claim and any intervening claims.
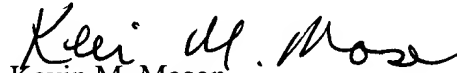
Conclusion

All of the pending claims, i.e., claims 1-10, 13-15, 18-20, 23-27, 29-35, 38, 47-48, 50-51, 53-54, 56-57, and 59, are in condition for allowance and such favorable action is earnestly

10   solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

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Respectfully submitted,

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